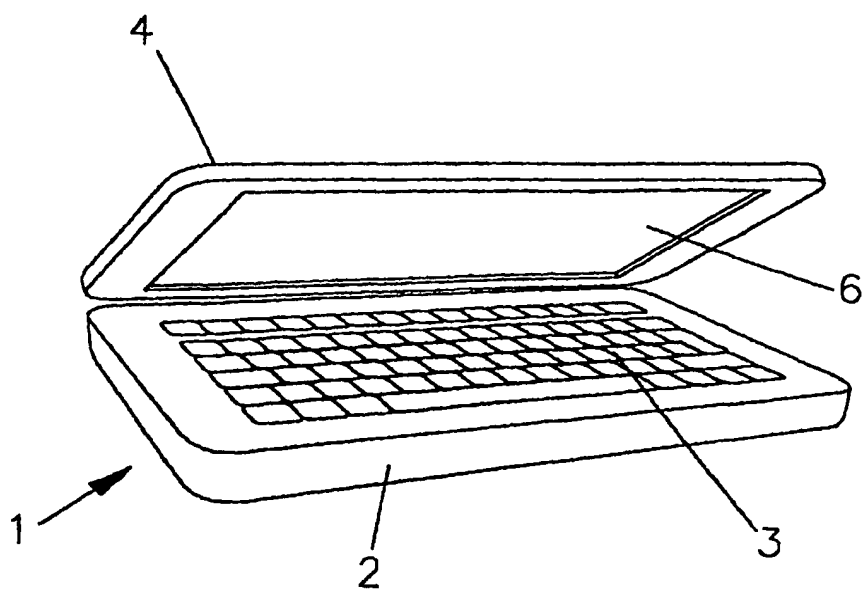




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>H04R 1/02, H04M 1/03, G06F 1/16,</b> <b>H04R 7/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/69212</b> <b>(43) International Publication Date:</b> 16 November 2000 (16.11.00)
<b>(21) International Application Number:</b> PCT/GB00/01427 <b>(22) International Filing Date:</b> 25 April 2000 (25.04.00) <b>(30) Priority Data:</b> 9909157.1                      22 April 1999 (22.04.99)                      GB <b>(71) Applicant (for all designated States except US):</b> NEW TRANS- DUCERS LIMITED [GB/GB]; Ixworth House, 37 Ixworth Place, London SW3 3QH (GB). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> COLLOMS, Martin [GB/GB]; 22 Burgess Hill, London NW2 2DA (GB). AZIMA, Henry [CA/GB]; 3 Southacre Close, Chaucer Road, Cambridge (GB). <b>(74) Agent:</b> MAGUIRE BOSS; 5 Crown Street, St. Ives, Cam- bridgeshire PR27 5EB (GB).		<b>(81) Designated States:</b> AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
<b>(54) Title:</b> SMALL ELECTRONIC ARTICLES FOR PERSONAL USE  <div style="text-align: center;">  </div> <b>(57) Abstract</b> <p>A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing.</p>		

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5        TITLE:        SMALL ELECTRONIC ARTICLES FOR PERSONAL USE

10                                DESCRIPTION

15                                TECHNICAL FIELD

The invention relates to small electronic articles for personal use, such for example, as mobile telephones, personal organisers and pocket radios.

It is an object of the invention to provide means  
20 whereby such electronic articles can be made to have an audio output without substantially adding to the weight or bulk of the article.

DISCLOSURE OF INVENTION

25        According to the invention, there is provided a personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a

vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing. Thus the personal portable electronic article is sufficiently small to be hand-held.

The radiator may be co-moulded integrally with the body or casing.

10 The radiator may be transparent and may, for example, define a display screen area.

The article may be a communications device, e.g. a cellular telephone.

The radiator may be a distributed mode acoustic radiator speaker e.g. of the kind described in WO97/09842.

#### BRIEF DESCRIPTION OF DRAWINGS

The invention is diagrammatically illustrated, by way of example, in the accompanying drawings, in which:-

Figure 1 is a front perspective view of a personal organiser incorporating a loudspeaker;

Figure 2 is a rear perspective view of the organiser shown in Figure 2;

25 Figure 3 is a front perspective view of a mobile telephone, and

Figure 4 is a rear perspective view of the telephone of Figure 4.

Figure 5 is a perspective view of a further embodiment of mobile telephone, and

Figure 6 is a partial cross-section through the casing of the mobile telephone of Figure 5.

5

#### BEST MODES FOR CARRYING OUT THE INVENTION

The personal organiser (1) shown in Figures 1 and 2 comprises a body (2) having a keyboard (3) and a lid (4) hinged to the body (2) and adapted to cover the keyboard, 10 the lid incorporating a visual display screen (6). The lid (4) is injection moulded from a suitable plastics material and comprises an integrally moulded bending wave acoustic radiator (12) driven by a vibration exciter (9) to form a loudspeaker, e.g. of the kind generally described in 15 WO97/09842.

Figures 3 and 4 show a mobile telephone (7) having a casing or body (8) having a front face (10) formed with a display panel (16) and a keypad (17). The rear face (11) of the casing of the telephone is formed integrally by 20 injection moulding with a bending wave acoustic radiator (12) driven by a piezo electric transducer or vibration exciter (9) to form a loudspeaker e.g. of the kind described in WO97/09842.

Thus in the arrangements of Figures 1 to 4 the casing 25 or body of the personal portable electronics article is injection moulded from plastics and a generally rectangular relatively thin acoustically active sub area of the casing or body is integrally moulded into the casing or body and

is bounded e.g. by a groove to provide a resilient suspension or alternatively by a thickened area or ridge to define the boundary of the panel. Slots (not shown) may be provided in the groove (18) and which pierce through the body or casing to increase the compliance of the suspension provided by the groove. Alternatively a resilient suspension, e.g. of elastomer may be co-moulded with the casing or body and the radiator panel can also be co-moulded directly on to the suspension.

10 In the mobile telephone (27) shown in Figures 5 and 6, which is generally similar to that of Figures 3 and 4, a front casing part (20) of the device (27) is formed with an acoustic radiator (X) including a transparent cover (19) over a visual display (16) which is excited by an inertial  
15 electrodynamic vibration exciter (9)

The invention thus provides a simple method of directly incorporating loudspeakers in small personal portable electronics articles.

CLAIMS

1. A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted,  
5 characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator  
10 defines a sub-area of the body or casing.
2. A personal portable electronic article according to claim 1, characterised in that the radiator is co-moulded integrally with the body or casing.
3. A personal portable electronic article according to  
15 claim 1 or claim 2, characterised in that the radiator is transparent.
4. A personal portable electronic article according to any one of claims 1 to 3, characterised in that the article is a communications device.
- 20 5. A personal portable electronic article according to claim 4, characterised in that the communications device is a cellular telephone.

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Figure 1

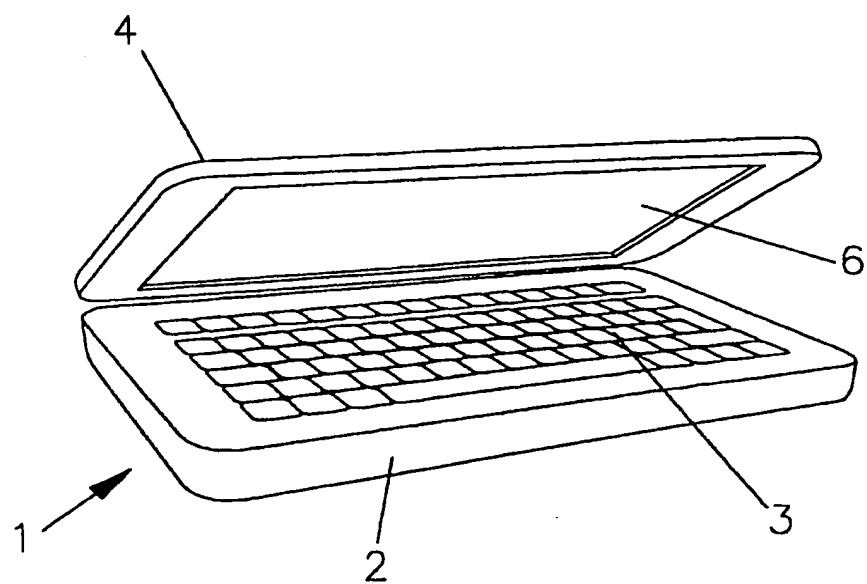
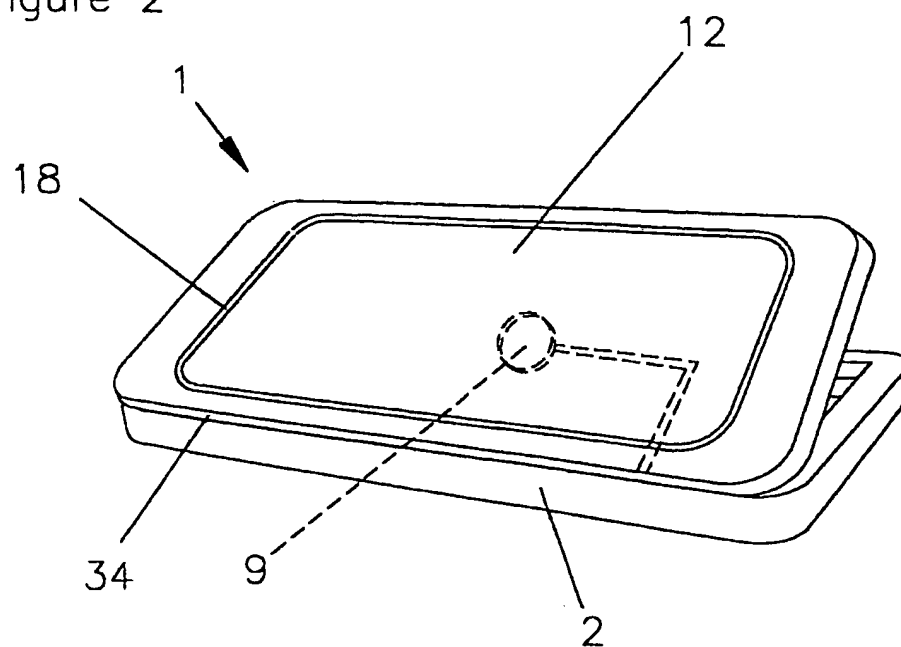


Figure 2





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Figure 3

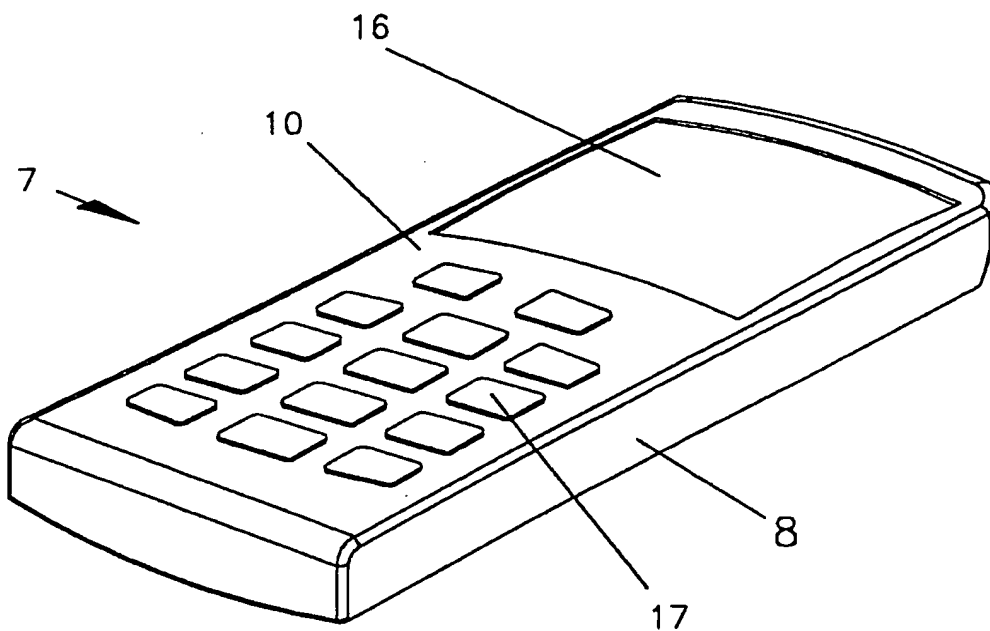
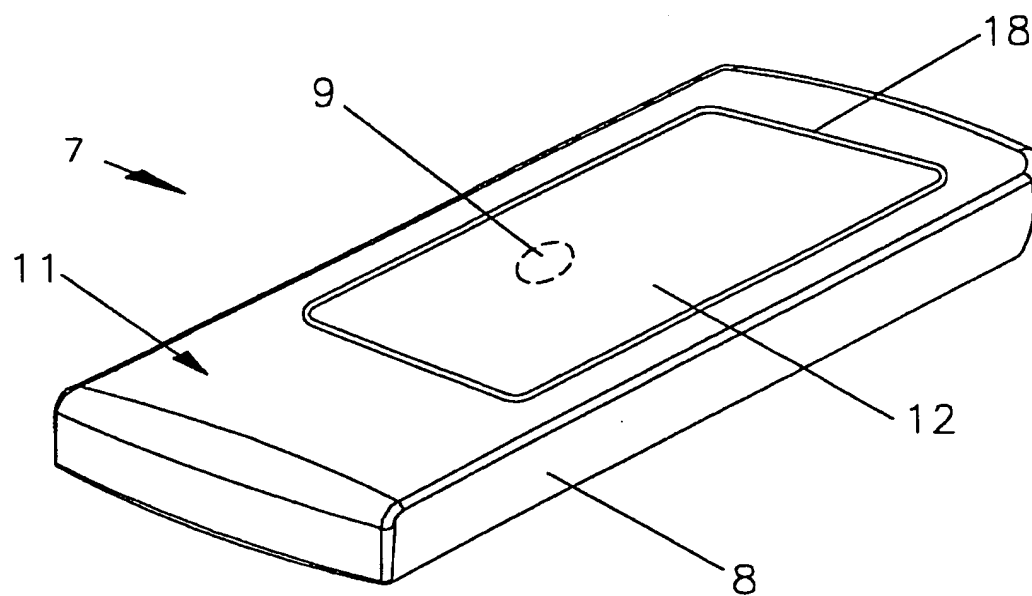


Figure 4



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Figure 5.

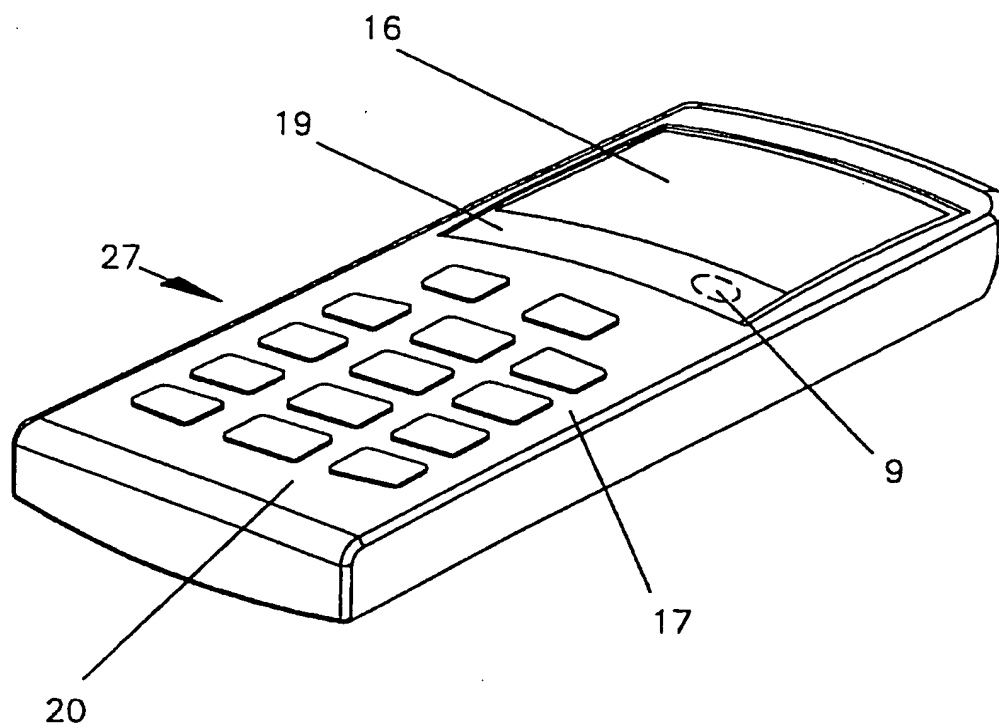
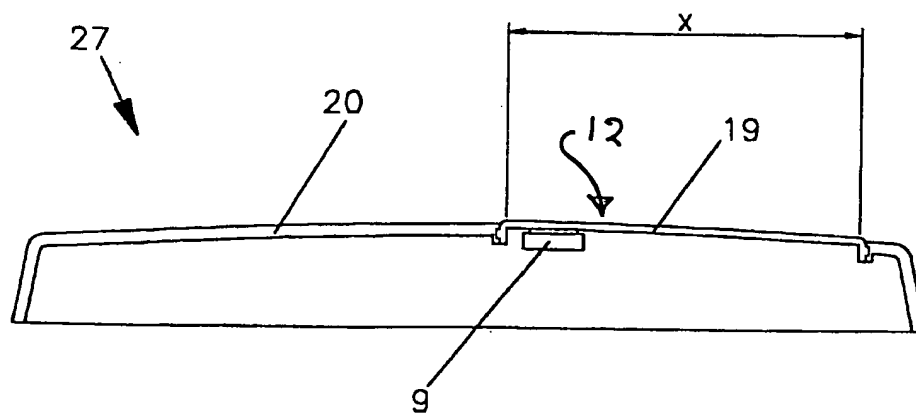


Figure 6



# INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 00/01427

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04R1/02 H04M1/03 G06F1/16 H04R7/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 43464 A (NEW TRANSDUCERS LTD ;AZIMA HENRY (GB); COLLOMS MARTIN (GB); CROCKE) 1 October 1998 (1998-10-01) page 4, line 6 -page 8, line 25; figures ---	1-5
Y	US 5 831 818 A (DAT ROVINDRA) 3 November 1998 (1998-11-03) column 2, line 39 -column 4, line 11; figures ---	1-5
A	WO 97 09842 A (AZIMA HENRY ;HARRIS NEIL (GB); COLLOMS MARTIN (GB); VERITY GROUP P) 13 March 1997 (1997-03-13) cited in the application page 70, line 21 - line 35; figure 29 --- -/--	1

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 815 570 A (ANNERINO FRANK JOHN ET AL) 29 September 1998 (1998-09-29) column 2, line 3 -column 4, line 28 ---	4,5
A	WO 98 21702 A (SYNAPTICS INC) 22 May 1998 (1998-05-22) page 11, line 12 -page 15, line 29; figures ---	1
P,X	WO 00 02417 A (NEW TRANSDUCERS LTD ;AZIMA HENRY (GB); MORECROFT DENIS (GB)) 13 January 2000 (2000-01-13) column 2, line 17 -column 8, line 14; figures ---	1
A	US 5 815 225 A (NELSON RICHARD F) 29 September 1998 (1998-09-29) column 2, line 21 -column 4, line 10; figures -----	1

## INTERNATIONAL SEARCH REPORT

### Information on patent family members

International Application No.

PCT/GB 00/01427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9843464 A	01-10-1998	AU 6511198 A	20-10-1998
		BG 103732 A	31-05-2000
		BR 9807880 A	22-02-2000
		CN 1250586 T	12-04-2000
		EP 0988772 A	29-03-2000
		NO 994589 A	21-09-1999
		PL 335804 A	22-05-2000
		ZA 9802331 A	23-09-1998
US 5831818 A	03-11-1998	NONE	
WO 9709842 A	13-03-1997	AT 177579 T	15-03-1999
		AT 177574 T	15-03-1999
		AT 177580 T	15-03-1999
		AT 177575 T	15-03-1999
		AT 186617 T	15-11-1999
		AT 177581 T	15-03-1999
		AT 177582 T	15-03-1999
		AT 177583 T	15-03-1999
		AT 177578 T	15-03-1999
		AT 177576 T	15-03-1999
		AT 179297 T	15-05-1999
		AT 177577 T	15-03-1999
		AT 179563 T	15-05-1999
		AT 176826 T	15-03-1999
		AT 179045 T	15-04-1999
		AT 179296 T	15-05-1999
		AT 177281 T	15-03-1999
		AT 179564 T	15-05-1999
		AT 177282 T	15-03-1999
		AT 179043 T	15-04-1999
		AT 179044 T	15-04-1999
		AU 702865 B	11-03-1999
		AU 6880196 A	27-03-1997
		AU 702920 B	11-03-1999
		AU 6880296 A	27-03-1997
		AU 702867 B	11-03-1999
		AU 6880396 A	27-03-1997
		AU 703015 B	11-03-1999
		AU 6880496 A	27-03-1997
		AU 702863 B	11-03-1999
		AU 6880596 A	27-03-1997
		AU 702873 B	11-03-1999
		AU 6880696 A	27-03-1997
		AU 702999 B	11-03-1999
		AU 6880796 A	27-03-1997
		AU 703061 B	11-03-1999
		AU 6880896 A	27-03-1997
		AU 703000 B	11-03-1999
		AU 6880996 A	27-03-1997
		AU 703071 B	11-03-1999
		AU 6881096 A	27-03-1997
		AU 703058 B	11-03-1999
		AU 6881296 A	27-03-1997
		AU 705592 B	27-05-1999
		AU 6881396 A	27-03-1997
		AU 703296 B	25-03-1999
		AU 6881496 A	27-03-1997

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/01427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9709842 A		AU 699890 B AU 6881596 A AU 703198 B	17-12-1998 27-03-1997 18-03-1999
US 5815570 A	29-09-1998	CN 1150356 A	21-05-1997
WO 9821702 A	22-05-1998	US 5920310 A	06-07-1999
WO 0002417 A	13-01-2000	AU 4520599 A WO 0054548 A	24-01-2000 14-09-2000
US 5815225 A	29-09-1998	AU 6034598 A WO 9832067 A	07-08-1998 23-07-1998